

APPENDIX D

HOW WE CAN GROW SMARTER

LAND COVER CHANGE PROBLEM:

Landsat Resources For Educators

Landsat in the Classroom (<http://landsat.gsfc.nasa.gov/main/education.html>)

The Landsat in the Classroom web site provides links to Landsat-related education materials. The site highlights education materials that completed the NASA Earth Science Enterprise educational product review and have been recommended for distribution. It also includes additional Landsat related education products. Each education product listing includes a brief description, target grade level, and a link to the product's web site. The web site is frequently updated with additional education materials.

Echo the Bat (Middle School)

<http://imagers.gsfc.nasa.gov/>

The IMAGERS (Interactive Multimedia Adventures for Grade-school Education using Remote Sensing) project is developed upon a framework which allows for the incorporation of new content, geographic location, and story line using satellite imagery as the foundation.

Earthshots: Satellite Images of Environmental Change (Middle/High)

<http://edcwww.cr.usgs.gov/earthshots/slow/tableofcontents>

Earthshots is an e-book of before-and-after Landsat images (1972-present), showing recent environmental events and introducing remote sensing. Earthshots is hosted at the U.S. Geological Survey's EROS Data Center, Sioux Falls S.D., the world's largest archive of earth science data and the official National Satellite Land Remote Sensing Data Archive.

Goddard Space Flight Center Earth and Space Sciences Education Project (Middle/High)

<http://edmall.gsfc.nasa.gov/inv99Project.Site/invhome.html>

This site includes a number of middle and high school lessons using NASA data and projects. The following lessons are Landsat related: 1) Landsat Detective Story - The Case of the Missing Ground Water, 2) Get into the Environment with Landsat, 3) Desert In Denial, 4) How Volcanoes Cover With Their Ash, and 5) White Sands And Landsat Bands. The lessons utilize materials from USGS Earthshots website and the Landsat 7 Gateway

Studying the Earth's Environment from Space (High School/Under Grad)

<http://see.gsfc.nasa.gov/edu/SEES>

Inquiry based classroom and lab activities for studying earth using satellite data. The program is aimed at high school and undergraduate levels.

Geomorphology from Space: A Global Overview of Regional Landforms (High School)

http://daac.gsfc.nasa.gov/DAAC_DOCS/geomorphology/GEO_HOME_PAGE.html

The site is a gallery of space imagery consisting of 237 Plates, each treating some geographic region where a particular landform theme is exemplified.

Remote Sensing Tutorial (Under Grad)

<http://rst.gsfc.nasa.gov>

Remote Sensing Tutorial is a tutorial approach to learning about the role of space science and technology in monitoring the Earth's surface and atmosphere.

Exploring the Environment (High School)

<http://www.cotf.edu/ete/modules/carbon/efremote.html>

Remote Sensing Activities on the Exploring the Environment (ETE) Program with is a part of NASA's Classroom of the future.

Exploring the Environment -Science Explorer (Middle School)

<http://www.cotf.edu/ete/modules/msese/explorer.html>

Middle School Earth Science Explorer (Teacher and Student Pages) – part of the Exploring the Environment (ETE) program.

Landsat Video

"From a Distance", a video produced for the Landsat 7 project, provides an excellent overview of the Landsat program and the Landsat 7 mission. In the video researchers discuss a wide range of Landsat 7 applications using animations and other visualizations to explain remote sensing, data gathering, and how Landsat data is used to address every day problems. The video (Record ID G99-030) is available at minimal cost to cover reproduction and distribution charges from:

Ann Morgan Duplication Prod. Manager
Interface Media Group
1233 20th Street, NW
Washington, DC 20036

PHONE: (202) 457 – 5821;
FAX: (202) 785 - 3216
EMAIL: AnnSmith@interfacevideo.com
<http://www.interfacevideo.com>

The USGS Landsat 7 Site <http://Landsat7.usgs.gov> features links to the Landsat 7 data archive, to Landsat 7 sample images, and to "Where is Landsat 7 Now?". The site is maintained by the U.S. Geological Survey's EROS Data Center in Sioux Falls, SD

Landsat 7 Browse Images and Obtaining Data

Landsat 7 Browse Image Viewer : <http://edclxs2.cr.usgs.gov/L7ImgViewer.shtml>

Earth Explorer: For PCs <http://edcsns17.cr.usgs.gov/EarthExplorer/>

EOS Data Gateway: <http://edcimswww.cr.usgs.gov/pub/imswelcome/>

The Landsat 7 Gateway <http://landsat.gsfc.nasa.gov> features Landsat 7 data characteristics, science and education applications, technical documentation, program policy, and history. The site is maintained by the Landsat 7 Project Science Office (LPSO) at the NASA Goddard Space Flight Center in Greenbelt, MD.

Landsat in the Classroom (<http://landsat.gsfc.nasa.gov/main/education.html>**)**

The Landsat in the Classroom web site provides links to Landsat–related education materials. The site highlights education materials that completed the NASA Earth Science Enterprise educational product review and have been recommended for distribution. It also includes additional Landsat related education products. Each education product listing includes a brief description, target grade level, and a link to the product's web site. The web site is frequently updated with additional education materials.

Images and Applications (<http://landsat.gsfc.nasa.gov/main/images.html>**)**

Images and Applications is a collection of Landsat images from many sources. Data and applications from Landsat 4, 5 and 7 are presented, as well as photographs of the construction and testing of Landsat 7. These links provide useful background information and visualizations of Landsat data.

The Landsat 7 Browse Image Gallery (http://landsat.gsfc.nasa.gov/data/Browse/Landsat7_Gallery.html) includes a sampling of Landsat 7 images from around the world. Check out the Band Comparisons link that includes black and white images of the six Landsat 7 thirty-meter bands (1-5, 7).

Applications of Landsat Data (http://landsat.gsfc.nasa.gov/images/Landsat_Applications.html) is a table containing numerous applications of Landsat data. Each application is accompanied by one or more representative Landsat images and a brief description of what the images show.

LANDSAT DATA

Landsat 7 Data Sets <http://landsat.gsfc.nasa.gov/education/l7downloads/download.html>

The Landsat 7 Download page provides a number of Landsat 7 scene subsets intended for use with Purdue University's MultiSpec software.

Landsat.org <http://landsat.org/>

Landsat.org supports the purchasing, distribution, and sharing of Landsat 7 imagery worldwide by providing a simplified, platform-independent user interface and search engine with online data ordering. Landsat.org supports research centers, science teams, and educational organizations by providing customized search interfaces, access to data hosting services, clearinghouse services, data brokering, and imagery cooperatives.

earth-info <http://www.earth-info.org>

"The **earth-info** web site is an exciting new Internet resource that provides anyone with a computer access to a world of imagery, maps, and other information. The **earth-info** site makes it easy to find, view and obtain geographic information available through government and commercial providers with a simple map based interface. The **earth-info** web site was developed by the National Technology Alliance (NTA), for which the U.S. National Imagery and Mapping Agency (NIMA) serves as the executive agent. The NTA worked with the National Center for Applied Technology (NCAT) in Springfield, Virginia and the National Information Display Lab (NIDL) in Princeton, New Jersey to create the **earth-info** web site and to establish partnerships with government, academic, and commercial providers of geospatial information and imagery. Some of the information on the site was formerly available only to the military or other government users. Additional data will be added to **earth-info** as it becomes releasable to the public."

Download Chesapeake Bay Landsat Data <http://chesapeake.towson.edu>

This site will enable you to download Landsat 7 ETM+ Color Composites (321, 432, 453, 742) and Landsat 7 ETM+ Individual Bands (1,2,3,4,5,6,7) for every state that has area in the Chesapeake Bay Watershed (WV, VA, MD, DE, DC, NJ, NY, PA, CT, RI).

AmericaView: <http://gateway2earth.org/>

Gateway2Earth/AmericaView is a national consortium of universities, colleges, schools, federal, state, local and tribal governments and industry designed to promote the development of the satellite remote sensing industry in the United States through improved access to geospatial data and technology for education and research. [Free Historical Landsat Imagery for Education:](http://ohioview.grc.nasa.gov/k12/) <http://ohioview.grc.nasa.gov/k12/>

Ohioview <http://www.ohioview.org/>

The Ohioview inventory currently contains Landsat 7 scenes taken over the following WRS Paths and Rows. Choose a path row combination from the list below to see a list of individual scenes.

WRS-2 PATH AND ROW WORLD MAP FOR LANDSAT 4,5,&7: <http://edcdaac.usgs.gov/tutorial/images/wrs2b.gif>

This image will help you find a Landsat images location when you find a image on the Internet that uses path and row spatial descriptions. Currently most data available on the Internet is posted "Landsat_ETM - Path: 18 Row: 31." Both AmericaView and OhioView have there data posted in this manner.

ADDITIONAL WEB PAGES

Download MultiSpec Program: <http://ee.www.ecn.purdue.edu/~biehl/MultiSpec/>

On the right side of the screen there will be the word DOWNLOAD. Click on Macintosh or Windows. On the next screen, choose the version you would like to download according to the computer you are using.

Download MultiSpec Tutorial: <http://www.dhba.com/globe/globe.html>

This tutorial uses animations and interactive elements to demonstrate the functions of MultiSpec and how you will use them to investigate and analyze Landsat images. The tutorial is broken up into sections, with each section focusing on a particular procedure. The tutorial was primarily developed for the GLOBE program, but non-GLOBE teachers can download either a PC or MAC version. This is an excellent way to introduce this software and satellite remote sensing techniques.

The Globe Program: www.globe.gov

Global Learning and Observations to Benefit the Environment (GLOBE) is a hands-on international environmental science and education program. GLOBE links students, teachers, and the scientific research community in an effort to learn more about our environment through student data collection and observation.

More MultiSpec Help/Information

<http://www.globe.unh.edu/>

This is a great resource for MultiSpec information, teaching materials and tutorials. It has links to many of the other sites listed on this page.

[http://archive.globe.gov/sda-bin/wt/ghp/tg+L\(en\)+P\(toolkit/Contents\)](http://archive.globe.gov/sda-bin/wt/ghp/tg+L(en)+P(toolkit/Contents))

You can also get here by going to the GLOBE web site www.globe.gov clicking on the Teacher's Guide and choosing Toolkit under the Chapters heading.

Landsat Image Analysis Workshop: <http://edmall.gsfc.nasa.gov/landsat>

Landsat Image Analysis Workshop web page includes links, lessons and training material for teachers using MultiSpec in the classroom.

NASA's Earth Observatory: <http://www.earthobservatory.nasa.gov>

The purpose of NASA's Earth Observatory is to provide a freely-accessible publication on the Internet where the public can obtain new satellite imagery and scientific information about our home planet. The focus is on Earth's climate and environmental change. In particular, we hope our site is useful to public media and educators. Any and all materials published on the Earth Observatory are freely available for re-publication or re-use, except where copyright is indicated. We ask that NASA's Earth Observatory be given credit for its original materials.

SATELLITE IMAGING: EXPLORING THE EARTH FROM SPACE: <http://members.aol.com/landsatcd/index.html>

This site provides information on obtaining free or low cost Landsat, GOES, and Space Shuttle images. Also included are links to free satellite image processing software. Tip sheets will show you how to create 3D perspective views of Landsat images and how to colorize GOES weather satellite imagery. I have included two "Satellite Art" images I made of places I enjoy visiting.

USGS Topographic Maps

<http://www.topozone.com/>

<http://www.gisdatadepot.com/>

"The GeoCommunity™ is place for the Geographic Information Systems (GIS), CAD, Mapping, and Location-Based industry professionals, enthusiasts, and students to gather." This web site has an extensive database of spatial, raster and vector, data. The data sets include the digital raster graphic (DRG) files for most of the United States. The data is located in the "Free Data" section

"A digital raster graphic (DRG) is a scanned image of a U.S. Geological Survey (USGS) [topographic map](http://topographicmap.usgs.gov). DRG's include the map and all map collar information. The USGS has produced DRG's of the 1:24,000-, 1:25,000-, 1:63,360- (Alaska), 1:100,000-, and 1:250,000-scale topographic map series. Coverage includes the standard series quadrangle maps of the United States and its trusts and territories." (<http://mapping.usgs.gov/digitalbackyard/drgbkyd.html>)

USGS MapFinder: http://edc.usgs.gov/Webglis/glisbin/finder_main.pl?dataset_name=MAPS_LARGE

A quick and easy way to find and order USGS 7.5 minute printed paper maps.

The 7.5-minute map series (1:24,000 scale) is one of several standard series maps produced by the US Geological Survey (USGS). One inch on a 7.5 minute map represents 2000 feet on the ground. Paper prints of this series, which are approximately 22 x 27 inches, can be ordered from this site.

USGS Aerial Photos

<http://terraserver.homeadvisor.msn.com/default.asp>

<http://www.usgs.gov/>

USGS PhotoFinder: http://edc.usgs.gov/Webglis/glisbin/finder_main.pl?dataset_name=NAPP

A quick and easy way to find and order USGS National Aerial Photography Program (NAPP) Photos.

NAPP, the National Aerial Photography Program, is an interagency Federal effort coordinated by the USGS, which uses NAPP products to revise maps. Other agencies have many other uses for these photographs, which, taken on roughly a 5-year cycle and produced to rigorous specifications, cover the entire lower 48 states. The photos are shot from airplanes flying at 20,000 feet. Each 9-by 9-inch photo (without enlargement) covers an area a bit more than 5 miles on a side.